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Filed : March 25, 2004

REMARKS

Claims 1 and 3 are canceled without prejudice to, or disclaimer of, the subject matter contained therein. Applicants maintain that the cancellation of a claim makes no admission as to its patentability and reserve the right to pursue the subject matter of the canceled claim in this or any other patent application.

Claims 6 and 8 are amended herein. The amendment to Claim 6 is supported by the specification, for example, at page 11, lines 16-22. The amendment to Claim 8 is supported by the specification, for example, at page 5, lines 8-19. No new matter is added by the amendments.

New Claim 18 is added. New Claim 18 is supported by the specification, for example, at page 4, line 22 through page 5, line 7. No new matter is added by the new claim.

Applicants thank the Examiner for review of the instant application. Upon entry of the amendment, Claims 6, 8 and 18 are presented for examination.

Rejection of Claims 1 and 3 under 35 U.S.C. §102(e)

Claims 1 and 3 are rejected under 35 U.S.C. §102(e), as being anticipated by Jiang *et al.* (U.S. Pat. No. 6,812,064).

Claims 1 and 3 are canceled herein. Accordingly, this rejection is now moot.

Rejection of Claims 6 and 8 under 35 U.S.C. §103

Claims 6 and 8 are rejected under 35 U.S.C. §103, as being obvious over Jiang *et al.* in view of Bennett *et al.* (U.S. Pat. No. 5,851,664).

Claim 6

Claim 6, as amended, is directed to a method for manufacturing a semiconductor device comprising the steps of: (i) providing a semiconductor wafer having a ground or polished surface activated in a grinding or polishing step, with semiconductor circuits formed thereon; (ii) deactivating the ground or polished surface; (iii) adhering a dicing sheet to the deactivated ground or polished surface of the wafer; and (iv) dicing the wafer with the dicing sheet.

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The Office Action states that Jiang only teaches dicing the wafer after the deactivation treatment by blowing ozone, and Bennett teaches adhering the dicing sheet to the ground or polished surface of the wafer, and thus it would be obvious to have the dicing sheet to be adhered to the ground or polished wafer in the process of Jiang. Applicant respectfully traverses this rejection.

First, although the Office Action states that Jiang only teaches dicing the wafer after the deactivation treatment by blowing ozone, Jiang in no way uses the term “deactivation”. Jiang oxidizes a silicon surface layer to form a silicon oxide layer (e.g., column 5, lines 11-31). Forming a silicon oxide layer from a silicon substrate layer is not deactivation. Deactivation is performed in combination with subsequent application of a dicing sheet. Although terminology itself cannot constitute a material difference, the Office Action’s characterization of Jiang extends beyond the teachings of Jiang. Jiang simply teaches forming silicon oxide on a wafer surface.

Second, Jiang forms silicon oxide solely in order to improve bonding with an adhesive paste. “In any case, the adhesive paste 160 is applied 20 to contact at least one of the silicon dioxide surface 155 and the surface 180 of the substrate 170, the die is then attached 30 to the substrate and the adhesive is cured 40.” (Jiang at column 5, lines 20-24). “In either case, the adhesive paste 160 is applied between the silicon dioxide layer 155 and the substrate.” (Jiang at column 5, lines 29-31). “These adhesives, like most adhesive pastes 160 used in semiconductor manufacturing, contain at least a portion of a silane coupling agent 165.” (Jiang at column 4, lines 42-45). See also Figs. 3A-3C. Thus, Jiang only teaches forming a silicon oxide layer to improve adhesive bonding to the substrate. Without the use of the adhesive paste, the silicon oxide layer is of no use. Further, as is clear from the above, the adhesive paste is used solely for attaching a semiconductor die to a substrate, regardless of whether attachment is accomplished before or after dicing (col. 5, lines 16-20, and Fig. 6A which shows adhesive attachment is conducted after dicing). Clearly, the adhesive paste in Jiang is not a dicing sheet, nor does it serve any function analogous to the function of a dicing sheet. Jiang gives absolutely no indication that a dicing sheet can be applied on the silicon oxide layer prior to applying the adhesive paste on the silicon oxide layer or that the silicon oxide layer is effective when used with a dicing sheet.

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It is well settled that if the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959) Thus, even though Bennett teaches adhering the dicing sheet to the ground or polished surface of the wafer, applying a dicing sheet to the silicon oxide layer prior to applying the adhesive paste changes the principle of operation of Jiang. Thus, this *prima facie* obviousness rejection based on Jiang in view of Bennett is not proper and cannot be maintained.

Third, Jiang teaches ozone treatment of a ground semiconductor die to improve adhesive bonding to a substrate. Jiang does not teach or suggest any problem that would arise from contacting a ground, untreated semiconductor wafer with a dicing sheet. In fact, Jiang does not teach or suggest any problem that might arise from not performing deactivation prior to dicing. For example, Jiang teaches that oxidation can be performed before or after dicing (column 5, lines 14-20) because the oxidation step is independent of the dicing step and does not involve application of a dicing sheet. Accordingly, Jiang does not provide any reason to adhere a dicing sheet to a ground surface of a wafer after deactivation treatment and prior to dicing.

Bennett teaches semiconductor wafer processing adhesives and tapes. Bennett does not teach or suggest any problem that might arise from grinding that would motivate one to deactivate a ground surface. Bennett does not teach or suggest any problem that might arise if a ground wafer surface is contacted with a dicing sheet. Thus, Bennett also does not provide any reason to adhere a dicing sheet to a ground surface of a wafer after deactivation treatment and prior to dicing.

Applicants have found that, by adhering a dicing sheet to a ground or polished surface of a semiconductor wafer after a deactivation treatment applied on the ground or polished surface thereof activated in a grinding or polishing step, dicing can be conducted in a state where a sticking force therebetween is reduced. By incorporating this deactivation treatment step, after-dicing methods such as picking up of semiconductor chips to which a dicing sheet is adhered is facilitated, and contamination of the semiconductor chips by the dicing sheet is inhibited (see, e.g., Table 1).

Jiang and Bennett, alone or combined, do not teach any problems associated with adhering a dicing sheet to a ground or polished semiconductor wafer. Jiang and Bennett, alone or

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combined, provide no motivation to one of ordinary skill in the art to adhere a dicing sheet to a ground surface of a wafer after deactivation treatment and prior to dicing. As such, Jiang and Bennett, alone or combined, do not teach or suggest the method of Claim 6. In view of the amendments to Claim 6 and the above remarks, Applicants respectfully request removal of the obviousness rejection of Claim 6.

Claim 8

Claim 8 is directed to a wafer back surface treating method comprising the steps of: (i) providing a semiconductor wafer having a ground or polished surface activated in a grinding or polishing step, with semiconductor circuits formed thereon; (ii) deactivating the ground or polished surface by blowing ozone-containing exhaust gas from cooling a UV lamp on the ground or polished surface of the wafer; and (iii) adhering a dicing sheet to the deactivated ground or polished surface of the wafer.

Neither Jiang nor Bennett, alone or combined, teach or suggest ozone-containing exhaust gas from cooling a UV lamp. Moreover, these references, alone or combined, do not teach or suggest blowing such ozone-containing exhaust gas to the ground or polished surface of a semiconductor wafer. Accordingly, Jiang nor Bennett, alone or combined, do not teach or suggest the method of Claim 8. In view of the amendments to Claim 8 and the above remarks, Applicants respectfully request removal of the obviousness rejection of Claim 8.

New Claim 18

New Claim 18 is directed to the method of Claim 6, wherein the deactivating step comprises blowing ozone on the ground or polished surface of the semiconductor wafer. Therefore, new Claim 18 contains all elements of Claim 6. Since Jiang and Bennett, alone or combined, do not teach or suggest the method of Claim 6, the references do not teach or suggest the method of new Claim 18, for at least the reasons provided above in regard to Claim 6.

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CONCLUSION

In view of the above, Applicants respectfully maintain that claims are patentable and request that they be passed to issue. Applicants invite the Examiner to call the undersigned if any remaining issues may be resolved by telephone.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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